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Description

Background of the Invention

This invention relates to an apparatus for filtering a medium, particularly to an improvement in methods and apparatus for filtering a medium by a brush filter, and to a method to use the apparatus.

US-A-4219420, discloses an arrangement for and a process of filtering a contaminated medium. According to the patent a plurality of fiber bundles are located on a support and extend within a filter housing in direction between an inlet and an outlet of the housing. The contaminated medium is introduced into the housing through the inlet in a direction towards the outlet. The contaminated particles become arrested among the fibers as it passes through the plurality of fiber bundles. In order to improve the "depth effect" of the fiber bundles, the fibers may have different length. The quality of the filtered medium depends on the density of the fiber bundles.

One of the disadvantages of the process and arrangement is that the density of the fiber bundles in the filtration process is the same as in the back-flushing process. In order to enhance the quality of the filtered medium, the density of the fibers must be increased, whereas the increase thereof within the arrangement will reduce the capacity of the arrangement to arrest contaminated particles and make the back-flushing process more difficult. For the process and the arrangement, therefore, the ability to enhance the quality of the filtered medium is limited and the flow speed of the contaminated medium in the arrangement is slow.

EP-A-0 119 340 discloses a filter element having a body member defining a central hollow space of venturi-like shape, the wall surface of which space is lined with a sleeve-like filter layer of fibers attached with their ends to rings. In the filtering mode the central portion of the filter element is compacted by a hollow, perforated mandril of a shape complementary to that of the filter wall at this portion, and the fluid entering the filter layer above the mandril is compelled to pass through "capillaries", leaving the layer below the mandril. In the flushing mode the mandril is lifted, thus loosening the filter layers and facilitating the flushing away of deposits. Thus, the apparatus compacts and loosens the fiber by mechanical means which not only cannot adjust the density of fibers evenly and thus affects the functioning of the fibers in the filtering process, but is prone to damaging the fibers as well.

GB-A-1 013 069 discloses an ion-exchanger bed using loose grained material. A resilient wall enclosing the bed and pressing it more or less is used to avoid damaging the granules of the expan-

sive anion exchanger and to adjust the height of the bed to offer a relief by which excessive pressure losses during the filtration are prevented. In addition, in order to avoid a locally excessive expansion of the resilient wall, coarse meshed fabrics in horizontal planes in the bed are used to delimit the expansion.

Summary of the Invention

The object of the present invention is to provide an apparatus and a method of filtering a medium which increase the capacity of catching contaminated particles, enhance the quality of the filtered medium, increase the speed of the filtering, and make the back-flushing much easier. By using the present invention, the following objects, i.e. increasing the capacity of catching contaminated particles; enhancing the quality of the filtered medium, and making the back-flushing process easy, will not contradict each other. The invention is defined in claims 1 and 12.

The present invention adopts a filter as defined in claim 1, i.e. a filter which comprises a filter housing having an inlet and an outlet, a supporting means located within the filter housing and close to the outlet, a plurality of fiber bundles located within the filter housing and extending along the elongation of the filter housing in the direction of the medium flow from the inlet towards the outlet, each of the plurality of fiber bundles having a first end and a second end, the first end of each of the plurality of fiber bundles being attached to the supporting means, means for preventing the second end of each of the plurality of fiber bundles from getting tangled with each other and from becoming compressed against the supporting means during the filtration process, and at least one flexible water-proof membrane which is located between the wall of the filter housing and the plurality of fiber bundles and thus forms a pressure chamber together with the wall of the filter housing which is called "out-membrane type", the pressure chamber having a pressurizing aperture and a release aperture.

The wall of the filter housing may be of soft structure. The filter may be either of sealed-pressure type or of open-weight type. For a large filter, a method of multiple-stage filtering may be adopted, by which a medium is filtered stage by stage. The filter may also be operated when the pressurizing aperture and a release aperture are open to the atmosphere, whereas the pressure within the filter is made below the atmosphere. In this case, the wall of the filter housing may be omitted.

The said membrane is of cylindrical shape, longer than the length of the filter housing and having a projecting portion on each of the two ends

thereof. The filter has a first cap and a second cap, each mounting on one end of the filter housing. The projecting portions of the membrane are attached to the contact surfaces between the filter housing and the first and second caps respectively. The flexible membrane may be of one of the following materials: polyvinyl chloride, rubberized fabric, polyester fiber, and rubber cloth.

To prevent the second ends of the fibers from being tangled with each other, the second ends of fibers are tied together in a member of separate bundles. The bundles are connected together by fibers to form a network.

To prevent the medium to be filtered from compressing the plurality of fiber bundles against the supporting means during the filtration process, the network may be weighted. Alternatively, at least one ring may be attached to the network and at least three limit means may be mounted on the second cap, the limit means protruding into the filter housing preventing the ring from moving in the direction of the medium flow.

The fibers used in the filter may be long fibers of various materials, or strips or belts made of long or short fibers. The surface of the fibers may be smooth or rough (e.g., to be made of screw shape).

To increase the density of fibers within the filter housing, the supporting means may be a multiple aperture curved plate, e.g., a multiple aperture special plate. The curved plate has a first set of apertures and a second set of apertures. The first ends of the plurality of fiber bundles are attached to the first set of apertures and the medium flow passes through the second set of apertures during the filtration process. The first ends of the plurality of fiber bundles may be fixed in the first set of apertures by being squeezed thereinto, or by being tied by fibers thereinto.

Another embodiment of the present invention is that the pressing membrane is mounted among the plurality of fiber bundles within the filter housing. A pipe is located within the membrane along the elongation of the filter housing. The lower end of the pipe is sealed and the upper end thereof extends out of the filter housing, and is provided with a valve. The pipe has a plurality of apertures. Thus, the space between the membrane and the pipe constitutes a pressure chamber, which is called "inner-membrane type".

Alternatively, there may be more than one membrane located within the filter housing. The membranes may be of the same type or may be of a combination of outer-membrane type and inner-membrane type, the forms of which should, based on the present invention, be obvious to a person skilled in the art.

One advantage of the present invention is that with the help of the flexible waterproof membrane

the extent of pressure of the membrane on the plurality of fiber bundles can be changed at will by adjusting the volume of pressurized water or gas in the membrane. Another advantage of the present invention is that because of the loss of its pressure when the medium passes through the plurality of fiber bundles during the filtration process the differential pressure between within the membrane and without is increased along the elongation of the filter housing in the direction of the medium flow from the inlet towards the outlet, whereas the volume of the pressure chamber remains unchanged. A frustum-like filter chamber is therefore formed, the diameters of which become smaller along the elongation of the filter housing from the inlet towards the outlet. Therefore, during filtration process the spaces among the plurality of fiber bundles are different along the elongation of the filter housing, becoming smaller from the inlet towards the outlet. Thus, the "depth effect" of the fiber bundles and then the quality of the filtered medium are improved, and the capacity of catching contaminated particles is also enhanced. During the back-flushing process the pressure in the membrane is released, and the frustum-like filter chamber is therefore disappeared, which makes the back-flushing very easy. In order to improve the effect of the back-flushing, compressed air may be used as the cleaning medium during the process as is known in the prior art. The filter may also be used in a manner that the inlet is put in the position higher than the outlet, whereas the weighter is replaced by a plurality of floats. In such a way, using compressed air as the cleaning medium during the back-flushing process is more convenient. In addition, a method of high speed partial flushing may be adopted in the back-flushing process. E.g. an apparatus for flushing the filter surface, which is known in the prior art, may be used, wherein the position of the spray nozzle is changed to be arranged along the vertical direction and the nozzle is of rotatory type or of translational type to flush the plurality of fiber bundles from the side of the supporting means.

The present invention enhances the quality of the filtered medium, increases the capacity of catching the contaminated particles and the filtering speed, and makes the back-flushing easy. Tests have shown that by using the present invention a medium can be obtained with filtering quality higher than present criteria. According to the present invention, all suspended substances and colloidal matters in water, including colloidal iron, organic compound and virus, can be filtered during the filtration process. A filter according to the present invention can not only filter suspended substances in water, but also can filter, where appropriate fibers are adopted, ions in water, other liquids and

gases. Therefore, replacing the known methods and filters the present invention provides a new method and filter which can efficiently filter mediums like contaminated water obtaining filtered medium with good quality.

The present invention can be best understood from the following description of specific embodiments with reference to the accompanying drawings.

Brief Description of The Drawings

Fig. 1 is a longitudinal sectional view of an outer-membrane type filter during the filtration process in accordance with the present invention;

Fig. 2 is a longitudinal sectional view of the filter as shown in Fig. 1 during the back-flushing process in accordance with the present invention;

Fig. 3 is a longitudinal sectional view of an outer-membrane type filter having fiber bundles attached with a ring retained by limit means during the filtration process in accordance with the present invention;

Fig. 4 is the perspective view of the filter as shown in Fig. 3;

Fig. 5 is a longitudinal sectional view of an inner-membrane type filter during the filtration process in accordance with the present invention;

Fig. 6 is a schematic view of a network connecting the one side ends of a plurality of fiber bundles;

Fig. 7 is a schematic view of a weighted network.

Fig. 8 is a schematic view of the interrelation between a ring and a limit means.

Detailed Description of The Preferred Embodiments

Referring to Fig. 1 and Fig. 2, the first embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a plurality of fiber bundles 11 and a flexible water-proof membrane 12. The caps 3, 4 and the filter housing 1 are connected together by flange 2. The upper part of the upper cap 3 has a water outlet 5 and a air release aperture 6. The lower part of the lower cap 4 has a water inlet 7 which is, through a three-way valve, connected to the source of water to be filtered and to a contaminated particle release outlet, respectively. The outlet 5, the release aperture 6, and the inlet 7 is provided with a valve respectively. A multiple aperture plate 9 constituting a supporting means 10 is attached to the flange connecting the upper cap

and the filter housing. The plate has a first set of apertures and a second set of apertures. The one ends of the plurality of fiber bundles 11 are attached to the first set of apertures, whereas the filtered medium passes through the second set of apertures,

To prevent the fiber bundles from getting tangled with each other, the other ends of the plurality of fiber bundles may be connected together by fibers to form a network (see FIG. 6) which is weighted by weights 19 (see FIG. 7). Alternatively, these ends of the plurality of fiber bundles may be, as is known in the prior art, weighted without connecting together to form a network. In this case, measures should be adopted to prevent the fiber bundles from getting tangled with each other and getting out of the direct way of the water flow, e.g., the diameter of the weights may be properly selected to enable the weights to contact each other, or support rings may be attached to the weights. Rings may be used as weights themselves. Several fiber bundles may be attached to a ring, and the rings contact each other or the rings may have different sizes and the smaller rings are arranged within the larger ones. A two-layer membrane 12 of polyvinyl chloride having cylindrical shape is arranged within the filter housing enclosing the plurality of fiber bundles to form a pressure chamber. The diameter of the membrane is equal to the inner diameter of the filter housing. The length of the membrane is longer than that of the filter housing. Each of the two ends of the membrane is attached to the respective flange. A pressurizing aperture 13 and a release aperture 14 for water or air having respective valve installed therewith are provided on the wall of the filter housing.

During the filtration process, the following steps are to be adopted: closing the release aperture 14; opening the outlet 5 and the air release aperture 6; opening the pressurizing aperture 13 to pressurize the pressure chamber to make the membrane 12 press the plurality of fiber bundles to certain degree; maintaining the pressure in the pressure chamber; closing the pressurizing aperture 13; and opening the water inlet 7. Because the water loses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like filter chamber (see FIG. 1). The spaces among the fiber bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the outlet. Therefore, the "depth effect" of the fiber bundles to filter water is improved. When water is filled in the filter housing, the air release aperture 6 is closed. The filtered water passes through the water outlet 5.

In order to improve the distribution of water to be filtered in the filter housing, a plate 15 is mounted facing the water introduced from the water inlet

7, and a multiple aperture plate 16 is mounted on the lower cap flange to introduce water into the filter housing through the apertures thereon. Another plate 17 is provided in front of the water outlet 5.

During the back-flushing process the following steps are to be adopted: opening the release aperture; closing the water outlet; squeezing out the water or air within the pressure chamber; closing the water inlet; opening the water outlet to introduce clean water into the filter housing; opening the contaminated particle release outlet to discharge the articles caught during the filtration process. The back-flushing process needs only a little time. An observation window may be provided on the wall of the filter housing for the purpose of observing the processes.

Referring to FIG. 3 and FIG. 4, the second embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a plurality of fiber bundles 11, and a flexible water-proof membrane 12. The caps 3 and 4 and the filter housing are connected together by flanges 2. The upper part of the upper cap 3 has a water outlet 5 and a air release aperture. The lower part of the lower cap 4 has a water inlet 7 which is connected to the source of water to be filtered and to a contaminated particle release outlet through a three-way valve. A multiple aperture curved plate 9 is attached to the flange connecting the upper cap and the filter housing. The curved plate has a first set of apertures and a second set of apertures. One ends of the plurality of fiber bundles 11 are attached to the first set of apertures, whereas the filtered medium passes through the second set of apertures. The other ends of the plurality of fiber bundles are connected together by fibers to form a network 18 (see Fig. 6) which is weighted by a ring 20. The ring is located below the flange connecting the lower cap and the filter housing. Three limit screws 21 mounted on the lower cap along the circumference thereof extend into the filter housing to stop the ring from moving along the direction of the medium flow (see FIG. 8). The flexible waterproof membrane 12 forming a pressure chamber is arranged within the filter housing enclosing the plurality of fiber bundles. The membrane is made of polyester fiber, the length of which is 60mm longer than that of the filter housing. A pressurizing aperture 13 and a release aperture 14 are provided on the wall of the filter housing.

During the filtration process, the pressure chamber is pressurized through the pressurizing aperture 13 to make the membrane 12 press the plurality of fiber bundles 11. Since the water loses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like

filter chamber. The spaces among the fiber bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the outlet. Therefore, the "depth effect" of the fiber bundles to filter water is improved. Because of the adoption of the ring and limit screws, the flow speed of water can be increased without getting the fiber bundles tangled with each other. To improve the distribution of water, plates may be mounted close to the inlet and the outlet, respectively. A plurality of observation windows 22 may be provided on the wall of the filter housing. The back-flushing process of the embodiment is similar to that of the first embodiment of the present invention.

Referring to FIG. 5, the third embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a connecting means 23, a plurality of fiber bundles 11, and a flexible water-proof membrane 12. The filter housing, caps 3 and 4, and the connecting means 23 are connected together by flanges 2. The connecting means 23 comprises a multiple aperture plate 9, and a pipe 24 which passes through the multiple aperture plate 9 and then turns 90° extending out of the connecting means. The lower end of the pipe 4 is sealed. A plurality of aperture are provided on the pipe wall below the multipie aperture plate 9. The membrane 12 is attached to and encloses the part of pipe 24 below the multipie aperture plate 9 to form a pressure chamber. The membrane is made of rubberized fabric and is of cylindrical shape, the diameter of which is such that when the membrane is fully pressurized it can press the plurality of fiber bundles to the extent that no spaces are left among the fiber bundles. The surface of each of the fibers is screw shaped. The multiple aperture plate 9 has a first set of apertures and a second set of apertures. One ends of the fiber bundles are attached to the first set of apertures and the filtered medium passes through the second set of apertures. The other ends of the fiber bundles are set free or connected together to form a network. To improve the distritution of the medium, plate 15 and 17 are provided close to an outlet 5 and an inlet 7 respectively.

During the filtration process, pressurized water or air is introduced into the pressure chamber through the pipe 24 to make the membrane 12 press the plurality of fiber bundles 11. The medium to be filtered is introduced into the filter through the inlet 7. Since the medium loses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like filter chamber. The spaces among the filter bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the out-

let. Therefore, the "depth effect" of the fiber bundles to filter the medium is improved. During the back-flushing process, the pressurized water or air in the pressure chamber is first released. The process is similar to that of the first embodiment of the present invention.

Claims

1. An apparatus for filtering a medium, comprising: a filter housing (1) having an inlet (7) and an outlet (5); a supporting means (10) located within the filter housing (1) and close to the outlet (5); a plurality of fiber bundles (11) located within the filter housing (1) and extending along the length of the filter housing (1) in the direction of the medium flow from the inlet (7) towards the outlet (5), each of the plurality of fiber bundles (11) having a first end and a second end, the first ends of the plurality of fiber bundles (11) being attached to the supporting means (10); and means (18, 19) for preventing the second end of each of the plurality of fiber bundles (11) from getting tangled with each other and from moving in the direction of the medium flow during the filtration process, characterized by at least one flexible waterproof membrane (12) located within the filter housing (1) and forming a pressure chamber (8) which has a pressurizing aperture (13, 24) and a release aperture (14, 24) and presses the plurality of fiber bundles (11) when pressurized during a filtration process so that the spaces among the plurality of fiber bundles along the elongation thereof become smaller towards the direction of the outlet. 10
2. An apparatus according to claim 1, characterized by an adjusting means to adjust the pressure in the pressure chamber (8) to control the extent to which the plurality of fiber bundles (11) are pressed thereby. 15
3. An apparatus according to claim 1, characterized in that the membrane (12) is mounted between the wall of the filter housing (1) and the plurality of fiber bundles (11). 20
4. An apparatus according to claim 1, characterized in that the membrane (12) is mounted among the plurality of fiber bundles (11). 25
5. An apparatus according to claim 1, characterized in that all of the second ends of the plurality of fiber bundles (11) are connected together by fibers (18) to form a network. 30
6. An apparatus according to claim 5, characterized in that the network is weighted (19). 35
7. An apparatus according to claim 5, characterized in that the network is connected to a plurality of floats. 40
8. An apparatus according to claim 5, wherein the filter has a first cap (3) and a second cap (4) mounted on the two ends of the filter housing (1) respectively and the second end of each of the plurality of fiber bundles (11) is close to the second cap (4), whereby at least one ring (20) is attached to the network and a plurality of limit means (21) are mounted on the second cap (4), the limit means (21) protruding into the filter housing (1) and preventing the ring (21) from moving in the direction of the medium flow. 45
9. An apparatus according to claim 1, characterized in that the supporting means (10) is a multiple aperture plate (9), the plate having a first set of apertures and a second set of apertures, the first ends of the plurality of fiber bundles (11) being attached to the first set of apertures, the filtered medium is passing through the second set of apertures during the filtration process. 50
10. An apparatus according to claim 9, characterized in that the supporting means (10) is a multiple aperture curved plate. 55
11. An apparatus according to claim 1, characterized in that the flexible membrane consists of one of the following materials: polyvinyl chloride, rubberized fabric, polyester fiber, and rubber cloth. 60
12. A method using the apparatus of any of claims 1 to 11 for filtering a medium and for flushing the filter, characterized in that before filtering, the pressure chamber (8) is pressurized to make the flexible membrane (12) press the plurality of fiber bundles (11) whereby the spaces among the fiber bundles along the length thereof become smaller towards the direction of the outlet (5); for filtering, the medium is passed through the filter by introducing said medium into the filter through the inlet (7), and (7) maintaining the pressure in the pressure chamber (8); and subsequently back-washing, the plurality of fiber bundles (11) in the filter to discharge particles caught during the filtration process out through a particle release outlet after having closed the inlet (7), upon releasing the pressure in the pressure chamber (8). 65

chamber (8).

13. A method according to claim 12, characterized in that the pressure in the pressure chamber (8) is adjusted to control the extent to which the plurality of fiber bundles (11) are pressed thereby.

Patentansprüche

1. Vorrichtung zum Filtrieren eines Mediums, umfassend: ein Filtergehäuse (1) mit einem Einlaß (7) und einem Auslaß (5); eine im Filtergehäuse (1) nahe dem Auslaß (5) angeordnete Trägereinrichtung (10); eine Vielzahl von im Filtergehäuse (1) angeordneten und sich entlang der Länge des Filtergehäuses (1) in Richtung des Mediumflusses vom Einlaß (7) zum Auslaß (5) erstreckenden Faserbündeln (11), die jeweils ein erstes und ein zweites Ende aufweisen, von denen die ersten Enden an der Trägereinrichtung (10) befestigt sind; und Einrichtungen (18, 19) zum Verhindern eines gegenseitigen Verschlingens der zweiten Enden der Faserbündel (11) und eines Bewegens der Faserbündel (11) in der Richtung des Mediumflusses während des Filtrationsprozesses, gekennzeichnet durch wenigstens eine flexible wasserdichte Membran (12), die innerhalb des Filtergehäuses (1) angeordnet ist und eine Druckkammer (8) bildet, die eine Öffnung (13, 24) zum Unterdrucksetzen und eine Öffnung (14, 24) zum Entlasten aufweist und, wenn sie während eines Filtrationsprozesses unter Druck gesetzt ist, auf die Faserbündel (11) drückt, so daß die Zwischenräume zwischen den Faserbündeln entlang deren Längserstreckung in Richtung zum Auslaß kleiner werden.
2. Vorrichtung nach Anspruch 1, gekennzeichnet durch eine Einstelleinrichtung zum Justieren des Drucks in der Druckkammer (8) zum Steuern des Ausmaßes, um das die Faserbündel (11) durch den Druck gedrückt werden.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Membran (12) zwischen der Wand des Filtergehäuses (1) und den Faserbündeln (11) montiert ist.
4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Membran (12) zwischen den Faserbündeln (11) montiert ist.
5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß alle zweiten Enden der Faserbündel (11) miteinander durch Fasern (18) unter Bildung eines Netzes verbunden sind.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß das Netz mit Gewichten (19) beschwert ist.
- 5 7. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß das Netz mit einer Mehrzahl von Schwimmkörpern verbunden ist.
- 10 8. Vorrichtung nach Anspruch 5, bei der das Filter eine erste Kappe (3) und eine zweite Kappe (4) aufweist, die jeweils an einem der beiden Enden des Filtergehäuses (1) montiert sind, und das zweite Ende der einzelnen Faserbündel (11) sich nahe der zweiten Kappe (4) befindet, wobei wenigstens ein Ring (20) am Netz befestigt ist und an der zweiten Kappe (4) eine Anzahl von Begrenzungsgliedern (21) montiert ist, die in das Filtergehäuse (1) vorstehen und verhindern, daß sich der Ring (21) in der Richtung des Mediumflusses bewegt.
- 15 9. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Trägereinrichtung (10) eine mit einer Anzahl von Öffnungen versehene Platte (9) ist, die eine erste Gruppe von Öffnungen und eine zweite Gruppe von Öffnungen aufweist, und daß die ersten Enden der Faserbündel (11) mit der ersten Gruppe von Öffnungen verbunden sind und das gefilterte Medium während des Filtrationsprozesses durch die zweite Gruppe von Öffnungen hindurchtritt.
- 20 10. Vorrichtung nach Anspruch 9, dadurch gekennzeichnet, daß die Trägereinrichtung (10) eine gekrümmte Platte mit zahlreichen Öffnungen ist.
- 25 11. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die flexible Membran aus einem der folgenden Materialien besteht: Polyvinylchlorid, gummiertes Gewebe, Polyesterfaser, Gummituch.
- 30 12. Verfahren unter Verwendung der Vorrichtung nach einem der Ansprüche 1 bis 11 zum Filtern eines Mediums und zum Spülen des Filters, dadurch gekennzeichnet, daß vor dem Filtern die Druckkammer (8) unter Druck gesetzt wird, um zu bewirken, daß die flexible Membran (12) auf die Faserbündel (11) drückt, wodurch die Zwischenräume zwischen den Faserbündeln entlang deren Länge in der Richtung zum Auslaß (5) kleiner werden; daß zum Filtern das Medium durch das Filter hindurchgeleitet wird, indem es über den Einlaß (7) in das Filter eingeführt wird und der Druck in der Druckkammer (8) aufrechterhalten wird; und daß anschließend die Faserbündel (11) im Fil-
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ter zum Entladen von während des Filtrationsprozesses eingefangenen Partikeln durch eine Partikel-Auslaßöffnung nach dem Schließen des Einlasses (7) und Entlasten des Drucks der Druckkammer (8) rückgespült werden.

13. Verfahren nach Anspruch 12, dadurch gekennzeichnet, daß der Druck in der Druckkammer (8) zur Steuerung des Ausmaßes, um das die Faserbündel (11) durch den Druck zusammengedrückt werden, justiert wird.

Revendications

1. Appareil de filtrage d'un milieu, comprenant : un boîtier de filtre (1) présentant une entrée (7) et une sortie (5); un moyen de support (10) situé à l'intérieur du boîtier de filtre (1) et proche de la sortie (5); une pluralité de faisceaux de fibres (11) situés dans le boîtier de filtre (1) et s'étendant sur la longueur du boîtier de filtre (1), dans la direction de l'écoulement de milieu depuis l'entrée (7), vers la sortie (5), chaque faisceau de la pluralité de faisceaux de fibres (11) présentant une première extrémité et une seconde extrémité, les premières extrémités de la pluralité de faisceaux de fibres (11) étant fixées aux moyens de support (10); et des moyens (18, 19) servant à empêcher la seconde extrémité de chaque faisceau de la pluralité de faisceaux de fibres (11) de s'enchevêtrer entre eux et de se déplacer dans la direction de l'écoulement de milieu pendant le processus de filtration, caractérisé par au moins une membrane étanche à l'eau (12) souple, située à l'intérieur du boîtier de filtre (1) et formant une chambre de pression (8), qui présente une ouverture de pressurisation (13, 24) et une ouverture de libération (14, 24) et presse la pluralité de faisceaux de fibres (11), lorsqu'ils sont pressurisés pendant un processus de filtration, de manière que les espaces situés entre la pluralité de faisceaux de fibres, sur sa longueur, deviennent plus petits en allant dans la direction de la sortie.
2. Appareil selon la revendication 1, caractérisé par un moyen d'ajustement, servant à ajuster la pression dans la chambre de pression (8), afin de commander la mesure dans laquelle la pluralité de faisceaux de fibres (11) est de ce fait pressée.
3. Appareil selon la revendication 1, caractérisé en ce que la membrane (12) est montée entre la paroi du boîtier de filtre (1) et la pluralité de faisceaux de fibres (11).
4. Appareil selon la revendication 1, caractérisé en ce que la membrane (12) est montée entre la pluralité de faisceaux de libres (11).
5. Appareil selon la revendication 1, caractérisé en ce que toutes les secondes extrémités de la pluralité de faisceaux de libres (11) sont reliées entre elles par des libres (18), afin de former un réseau.
- 10 6. Appareil selon la revendication 5, caractérisé en ce que le réseau est pondéré (19).
7. Appareil selon la revendication 5, caractérisé en ce que le réseau est relié à une pluralité de flotteurs.
- 20 8. Appareil selon la revendication 5, dans lequel le filtre présente un premier couvercle (3) et un second couvercle (4) montés respectivement sur les deux extrémités du boîtier de filtre (1) et la seconde extrémité de chaque faisceau de la pluralité de faisceaux de libres (11) est proche du second couvercle (4), de manière qu'au moins une bague (20) soit fixée au réseau et qu'une pluralité de moyens de limitation (21) soient montés sur le second couvercle (4), les moyens de limitation (21) faisant saillie dans le boîtier de filtre (1) et empêchant la bague (21) de se déplacer dans la direction de l'écoulement du milieu.
- 25 9. Appareil selon la revendication 1, caractérisé en ce que le moyen de support (10) est une plaque à ouvertures multiples (9), la plaque présentant un premier jeu d'ouvertures et un second jeu d'ouvertures, les premières extrémités de la pluralité de faisceaux de libres (11) étant fixées au premier jeu d'ouvertures, le milieu filtré passant par le second jeu d'ouvertures durant le processus de filtrage.
- 30 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 1235 1240 1245 1250 1255 1260 1265 1270 1275 1280 1285 1290 1295 1300 1305 1310 1315 1320 1325 1330 1335 1340 1345 1350 1355 1360 1365 1370 1375 1380 1385 1390 1395 1400 1405 1410 1415 1420 1425 1430 1435 1440 1445 1450 1455 1460 1465 1470 1475 1480 1485 1490 1495 1500 1505 1510 1515 1520 1525 1530 1535 1540 1545 1550 1555 1560 1565 1570 1575 1580 1585 1590 1595 1600 1605 1610 1615 1620 1625 1630 1635 1640 1645 1650 1655 1660 1665 1670 1675 1680 1685 1690 1695 1700 1705 1710 1715 1720 1725 1730 1735 1740 1745 1750 1755 1760 1765 1770 1775 1780 1785 1790 1795 1800 1805 1810 1815 1820 1825 1830 1835 1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080 2085 2090 2095 2100 2105 2110 2115 2120 2125 2130 2135 2140 2145 2150 2155 2160 2165 2170 2175 2180 2185 2190 2195 2200 2205 2210 2215 2220 2225 2230 2235 2240 2245 2250 2255 2260 2265 2270 2275 2280 2285 2290 2295 2300 2305 2310 2315 2320 2325 2330 2335 2340 2345 2350 2355 2360 2365 2370 2375 2380 2385 2390 2395 2400 2405 2410 2415 2420 2425 2430 2435 2440 2445 2450 2455 2460 2465 2470 2475 2480 2485 2490 2495 2500 2505 2510 2515 2520 2525 2530 2535 2540 2545 2550 2555 2560 2565 2570 2575 2580 2585 2590 2595 2600 2605 2610 2615 2620 2625 2630 2635 2640 2645 2650 2655 2660 2665 2670 2675 2680 2685 2690 2695 2700 2705 2710 2715 2720 2725 2730 2735 2740 2745 2750 2755 2760 2765 2770 2775 2780 2785 2790 2795 2800 2805 2810 2815 2820 2825 2830 2835 2840 2845 2850 2855 2860 2865 2870 2875 2880 2885 2890 2895 2900 2905 2910 2915 2920 2925 2930 2935 2940 2945 2950 2955 2960 2965 2970 2975 2980 2985 2990 2995 3000 3005 3010 3015 3020 3025 3030 3035 3040 3045 3050 3055 3060 3065 3070 3075 3080 3085 3090 3095 3100 3105 3110 3115 3120 3125 3130 3135 3140 3145 3150 3155 3160 3165 3170 3175 3180 3185 3190 3195 3200 3205 3210 3215 3220 3225 3230 3235 3240 3245 3250 3255 3260 3265 3270 3275 3280 3285 3290 3295 3300 3305 3310 3315 3320 3325 3330 3335 3340 3345 3350 3355 3360 3365 3370 3375 3380 3385 3390 3395 3400 3405 3410 3415 3420 3425 3430 3435 3440 3445 3450 3455 3460 3465 3470 3475 3480 3485 3490 3495 3500 3505 3510 3515 3520 3525 3530 3535 3540 3545 3550 3555 3560 3565 3570 3575 3580 3585 3590 3595 3600 3605 3610 3615 3620 3625 3630 3635 3640 3645 3650 3655 3660 3665 3670 3675 3680 3685 3690 3695 3700 3705 3710 3715 3720 3725 3730 3735 3740 3745 3750 3755 3760 3765 3770 3775 3780 3785 3790 3795 3800 3805 3810 3815 3820 3825 3830 3835 3840 3845 3850 3855 3860 3865 3870 3875 3880 3885 3890 3895 3900 3905 3910 3915 3920 3925 3930 3935 3940 3945 3950 3955 3960 3965 3970 3975 3980 3985 3990 3995 4000 4005 4010 4015 4020 4025 4030 4035 4040 4045 4050 4055 4060 4065 4070 4075 4080 4085 4090 4095 4100 4105 4110 4115 4120 4125 4130 4135 4140 4145 4150 4155 4160 4165 4170 4175 4180 4185 4190 4195 4200 4205 4210 4215 4220 4225 4230 4235 4240 4245 4250 4255 4260 4265 4270 4275 4280 4285 4290 4295 4300 4305 4310 4315 4320 4325 4330 4335 4340 4345 4350 4355 4360 4365 4370 4375 4380 4385 4390 4395 4400 4405 4410 4415 4420 4425 4430 4435 4440 4445 4450 4455 4460 4465 4470 4475 4480 4485 4490 4495 4500 4505 4510 4515 4520 4525 4530 4535 4540 4545 4550 4555 4560 4565 4570 4575 4580 4585 4590 4595 4600 4605 4610 4615 4620 4625 4630 4635 4640 4645 4650 4655 4660 4665 4670 4675 4680 4685 4690 4695 4700 4705 4710 4715 4720 4725 4730 4735 4740 4745 4750 4755 4760 4765 4770 4775 4780 4785 4790 4795 4800 4805 4810 4815 4820 4825 4830 4835 4840 4845 4850 4855 4860 4865 4870 4875 4880 4885 4890 4895 4900 4905 4910 4915 4920 4925 4930 4935 4940 4945 4950 4955 4960 4965 4970 4975 4980 4985 4990 4995 5000 5005 5010 5015 5020 5025 5030 5035 5040 5045 5050 5055 5060 5065 5070 5075 5080 5085 5090 5095 5100 5105 5110 5115 5120 5125 5130 5135 5140 5145 5150 5155 5160 5165 5170 5175 5180 5185 5190 5195 5200 5205 5210 5215 5220 5225 5230 5235 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8240 8245 8250 8255 8260 8265 8270 8275 8280 8285 8290 8295 8300 8305 8310 8315 8320 8325 8330 8335 8340 8345 8350 8355 8360 8365 8370 8375 8380 8385 8390 8395 8400 8405 8410 8415 8420 8425 8430 8435 8440 8445 8450 8455 8460 8465 8470 8475 8480 8485 8490 8495 8500 8505 8510 8515 8520 8525 8530 8535 8540 8545 8550 8555 8560 8565 8570 8575 8580 8585 8590 8595 8600 8605 8610 8615 8620 8625 8630 8635 8640 8645 8650 8655 8660 8665 8670 8675 8680 8685 8690 8695 8700 8705 8710 8715 8720 8725 8730 8735 8740 8745 8750 8755 8760 8765 8770 8775 8780 8785 8790 8795 8800 8805 8810 8815 8820 8825 8830 8835 8840 8845 8850 8855 8860 8865 8870 8875 8880 8885 8890 8895 8900 8905 8910 8915 8920 8925 8930 8935 8940 8945 8950 8955 8960 8965 8970 8975 8980 8985 8990 8995 9000 9005 9010 9015 9020 9025 9030 9035 9040 9045 9050 9055 9060 9065 9070 9075 9080 9085 9090 9095 9100 9105 9110 9115 9120 9125 9130 9135 9140 9145 9150 9155 9160 9165 9170 9175 9180 9185 9190 9195 9200 9205 9210 9215 9220 9225 9230 9235 9240 9245 9250 9255 9260 9265 9270 9275 9280 9285 9290 9295 9300 9305 9310 9315 9320 9325 9330 9335 9340 9345 9350 9355 9360 9365 9370 9375 9380 9385 9390 9395 9400 9405 9410 9415 9420 9425 9430 9435 9440 9445 9450 9455 9460 9465 9470 9475 9480 9485 9490 9495 9500 9505 9510 9515 9520 9525 9530 9535 9540 9545 9550 9555 9560 9565 9570 9575 9580 9585 9590 9595 9600 9605 9610 9615 9620 9625 9630 9635 9640 9645 9650 9655 9660 9665 9670 9675 9680 9685 9690 9695 9700 9705 9710 9715 9720 9725 9730 9735 9740 9745 9750 9755 9760 9765 9770 9775 9780 9785 9790 9795 9800 9805 9810 9815 9820 9825 9830 9835 9840 9845 9850 9855 9860 9865 9870 9875 9880 9885 9890 9895 9900 9905 9910 9915 9920 9925 9930 9935 9940 9945 9950 9955 9960 9965 9970 9975 9980 9985 9990 9995 10000 10005 10010 10015 10020 10025 10030 10035 10040 10045 10050 10055 10060 10065 10070 10075 10080 10085 10090 10095 10100 10105 10110 10115 10120 10125 10130 10135 10140 10145 10150 10155 10160 10165 10170 10175 10180 10185 10190 10195 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de faisceaux de fibres (11), de manière que les espaces existant entre les faisceaux de fibres, dans leur longueur, deviennent plus petits en allant dans la direction de la sortie (5); afin d'être filtré, le milieu est passé dans le filtre par l'introduction dudit milieu dans le filtre, par l'intermédiaire de l'entrée (7) et le maintien de la pression dans la chambre de pression (8); et, ensuite, on rince à contre-courant la pluralité de faisceaux de fibres (11) situés dans le filtre, afin d'évacuer vers l'extérieur les particules piégées durant le processus de filtrage, par l'intermédiaire d'une sortie d'évacuation de particules, après avoir fermé l'entrée (7), lors de la libération de la pression dans la chambre de pression (8).

13. Procédé selon la revendication 12, caractérisé en ce que la pression régnant dans la chambre de pression (8) est ajustée afin de commander la mesure selon laquelle la pluralité de faisceaux de fibres (11) est de ce fait pressée.

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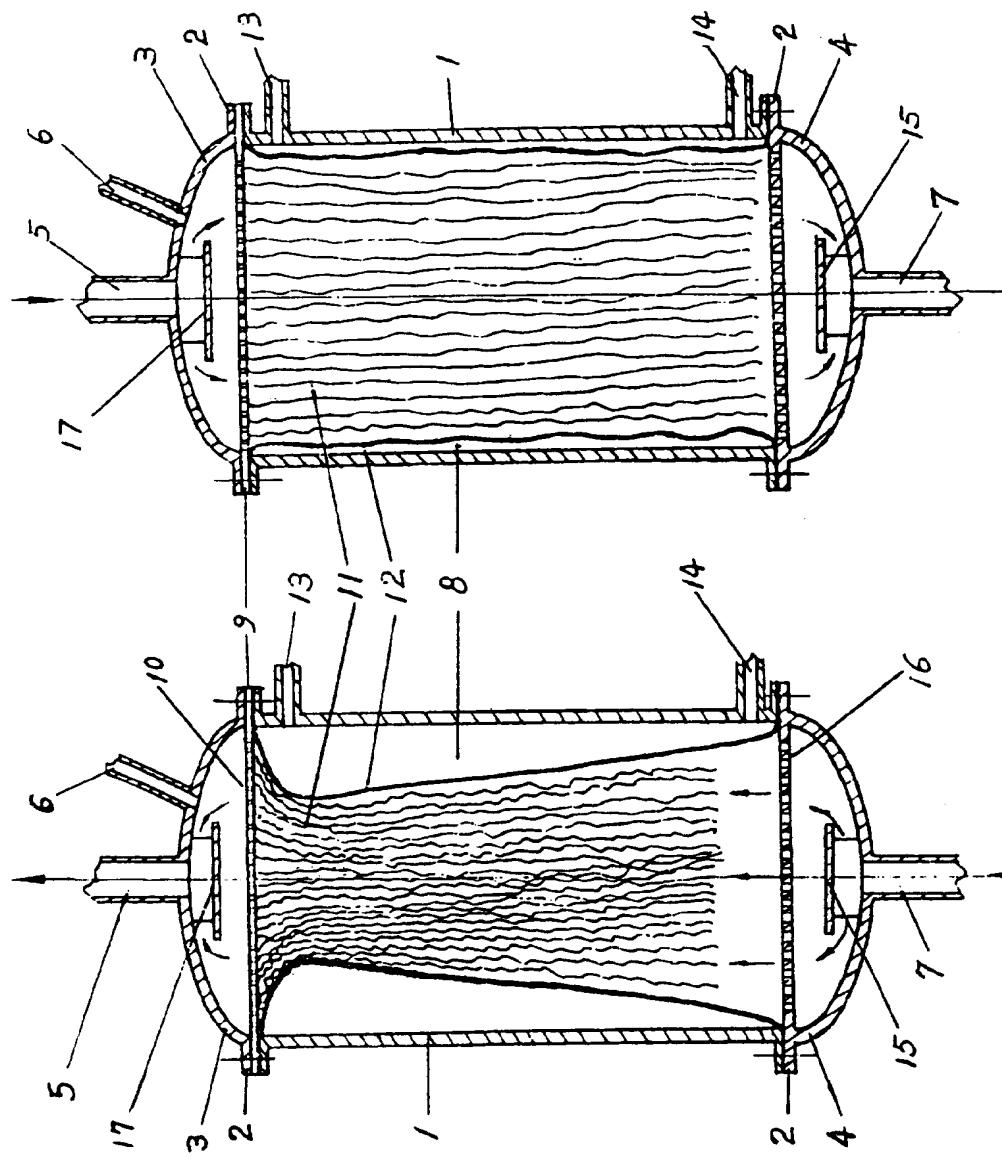


FIG. 2

FIG. 1

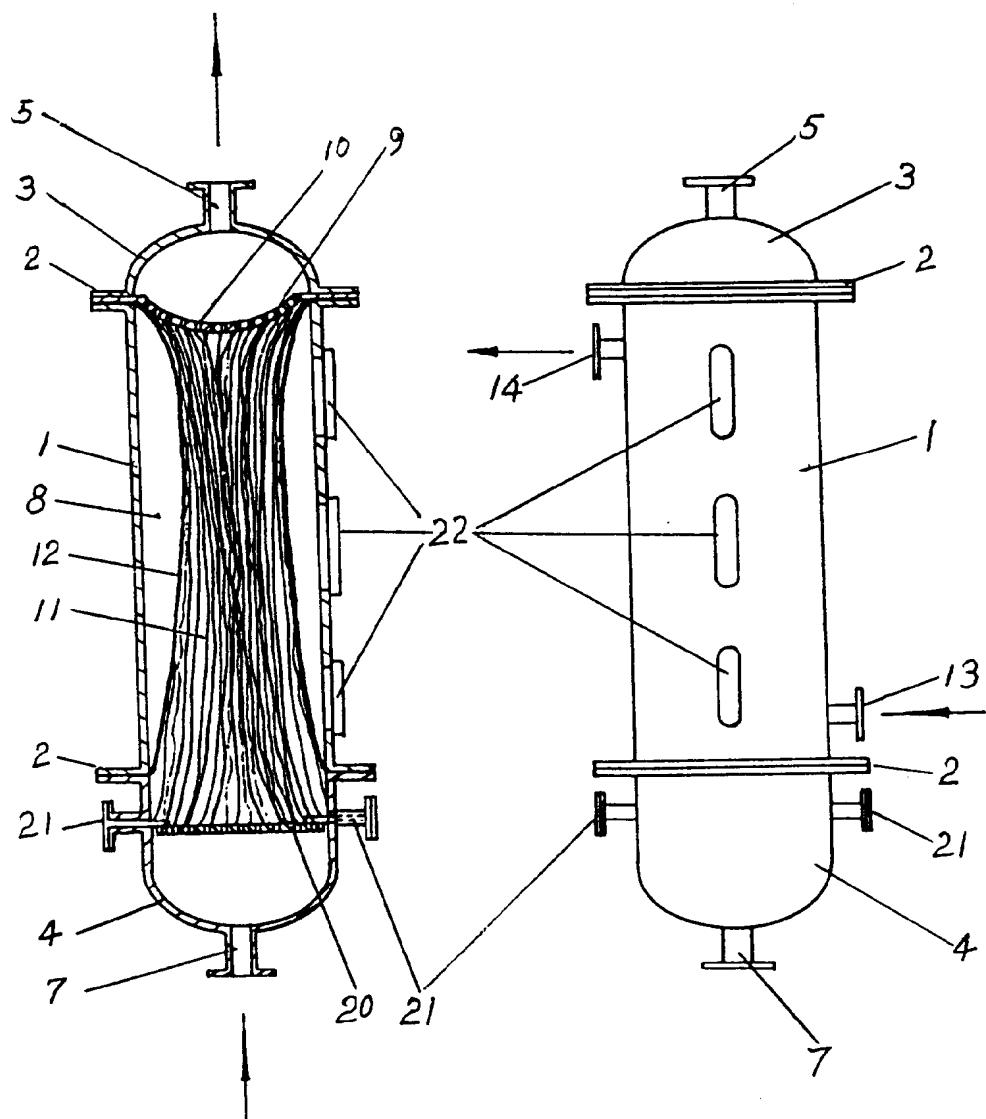


FIG. 3

FIG. 4

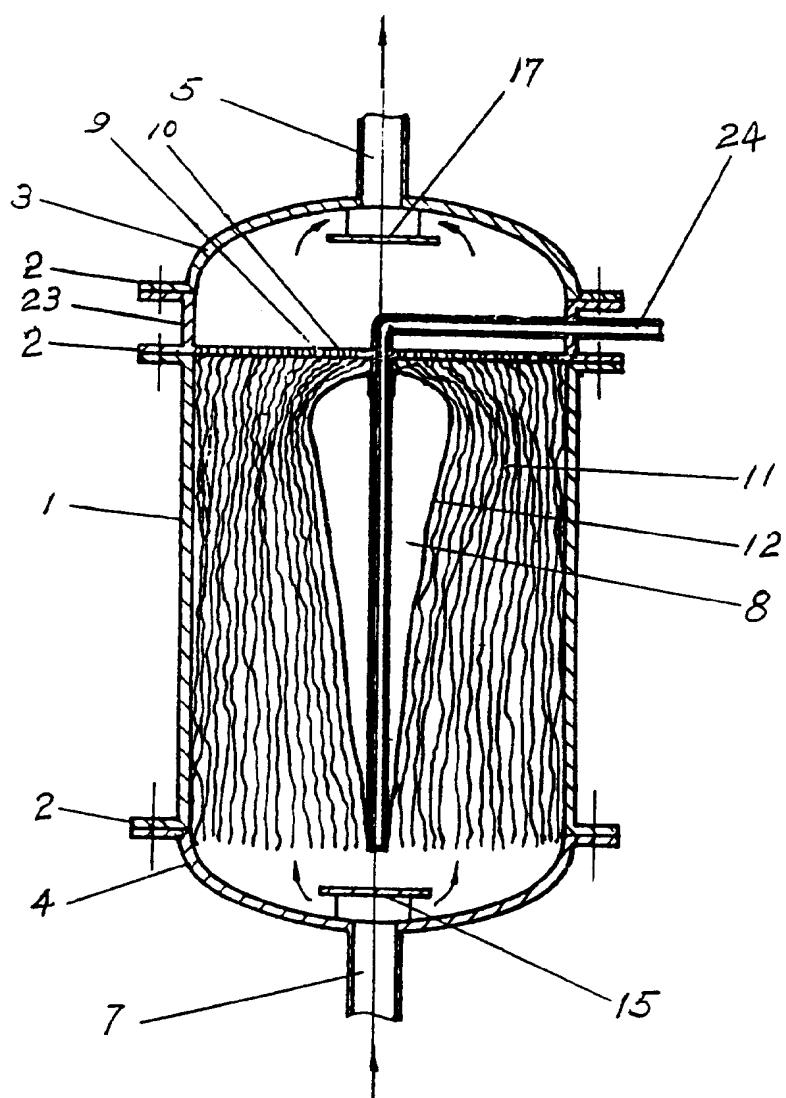


FIG. 5

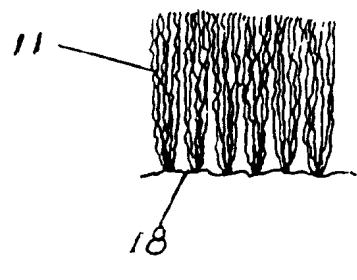


FIG. 6

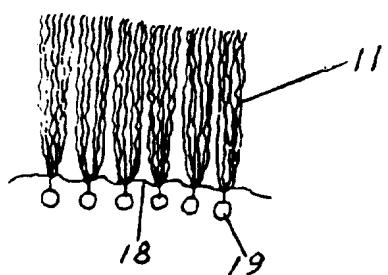


FIG. 7

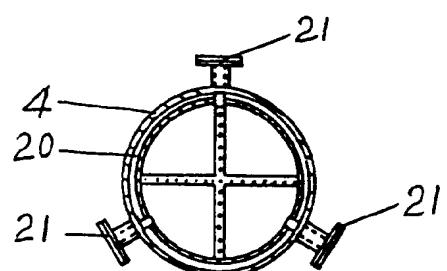


FIG. 8